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Application for Letters Patent of the United States

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Title of Invention:

FLUIDIZED-BED REACTOR FOR THE OXYCHLORINATION OF ETHYLENE, OXYGEN AND HCl

To All Whom It May Concern:

The following is a specification of the aforesaid Invention.

FLUIDIZED-BED REACTOR FOR THE OXYCHLORINATION OF ETHYLENE, OXYGEN AND HCl

The present invention relates to a fluidized-bed reactor for the oxychlorination of ethylene, oxygen and HCl, comprising a heat exchanger, consisting of a plurality of tube packets, in the fluidized bed for releasing the heat evolved owing to exothermic reactions to a heat-transfer medium in the tube packets, in particular to water/steam, the tube packets coming into contact with water via a ring pipe and the steam being removed via a ring pipe.

In the oxychlorination, ethylene, oxygen and HCl are reacted in a fluidized-bed reactor (oxychlorination reactor) over a copper-containing catalyst to give 1,2-dichloroethane and water. The heat evolved in this reaction is released by the catalyst, via a tube system present in the reactor (and consisting of a plurality of tube packets) to boiler feed water for steam generation or to a heat-transfer medium. The BFW (the heat-transfer medium) is distributed over the tube system to a ring pipe present outside the reactor. The steam formed (the heated-up heat-transfer medium) is collected and removed via a ring pipe, likewise present outside the reactor.

In the known embodiment, there are, inter alia, the following disadvantages:

Depending on the number of tube packets in the internal tube system, the two external ring pipes have a large number of connecting pipes through the wall to the tube packets. In the connecting pipes for the cooling water (the heat-transfer medium), aperture plates are used in additional flange connections to achieve uniform distribution over the individual tube packets via the pressure loss. Accessibility and maintenance of the ring pipes are achieved by means of a 360° platform. Simulation of the ring pipes as a model for the pipe stress calculations is very complex and expensive. The oxychlorination reactor must be very carefully insulated to avoid falling below the dew point. Owing to the many wall connection pieces for the ring pipe connections and the platform consoles, this is very difficult and time-consuming.

It is the object of the invention to provide a solution by means of which, while avoiding the disadvantages described above, a compact but economical solution which is easy to manufacture is provided, which solution avoids the expensive drilled holes, and in particular facilitates the calculation of the ring pipes and dispenses with a large number of wall passages.

This object is achieved, according to the invention, by an apparatus of the type defined at the outset

if the ring pipe is mounted as a collector or chamber directly on the reactor wall.

By means of the invention, it is possible to replace the large number of wall passages or the aperture plates by simple holes in the internal collector, considerably simplifying the insulation of the reactor.

Further embodiments of the invention are evident from the subclaims, which relate to the particularly expedient designs of the apparatus according to the invention.

In a particular embodiment, for example, the holes for connecting the pipelines are in the form of throttle holes for defining a desired pressure loss and hence for ensuring uniform flows over the various tube packets.

Thus, the pressure distribution in the collector and the pipelines can be influenced by the corresponding precalculated choice of the diameter alone.

The invention is illustrated in more detail below, by way of example, with reference to the drawing. This shows in

Fig. 1 a schematic simplified diagram of the passage region of the pipelines according to the prior art with external ring collectors,

Fig. 2 by way of comparison a diagram of the embodiment according to the invention and

Fig. 3 to 8 different design variants of the invention as simplified sectional diagrams in the region of the reactor wall.

Fig. 1 shows a solution according to the prior art. Here, the reactor denoted in general by 1 has a large number of tube packets 2 as heat exchanger, comprising ring pipes 5 and 6, arranged on a console 3 outside the reactor wall 4, for, for example, the inflowing cooling water in the ring pipe 5 and withdrawn steam in the ring pipe 6. It is evident, however, that the feed and discharge pipes 7 and 8, respectively, must be led individually through the reactor wall, and the associated computational, design and manufacturing effort is clear.

Fig. 2 shows, represented in the same manner, a simplified section through the corresponding part of the reactor according to the invention, likewise denoted by 1.

Here, the tube bundles 2 end in two ring collectors 9 and 10 which are mounted in the interior on the wall and are, for example, rectangular or trapezoidal, the heat-exchange medium being introduced via the ring collector or distributor 9 and the steam being removed, for example, via the collector 10. For this purpose, only two transverse connecting pieces 11 and 12 pass through the reactor wall 4 in the example shown in Fig. 2. The feed pipes 7 and the return pipes 8 for the steam pass only through the inner wall of the collectors 9 and 10, respectively.

Figs. 3 to 8 show embodiments relating to the shape and mounting of the collectors 9 and 10. It is evident that throttle holes, denoted in general by 13, are provided, for example, in the passage walls and also in the reactor wall in order to establish or compensate pressure differences. These holes may vary in size depending on positioning relative to the feed connecting piece and the discharge connecting piece.